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Lunar free core nutation detection opens new tasks for the lunar laser ranging and future space missions

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Abstract

© 2018, American Institute of Aeronautics and Astronautics Inc, AIAA. All rights reserved. Study of the spin-orbital dynamics of the Moon has two important goals. On the one hand, a high-precision theoretical description of lunar rotation ensures the reliability of navigational maneuvers in the near-moon space and on the lunar surface. On the other hand, space experiments provide the researchers with the necessary information about the features of the lunar figure, its internal structure, which again contributes to the improvement of the theory and, accordingly, the competent construction of the lunar navigation system. One of the topical tasks is the study of the complex stratigraphy of the lunar body and, especially, the search for observational manifestations of a lunar core and the evaluation of its parameters. Solution of these problems will allow deducing the accuracy of the theory of physical libration to a higher level; will help to develop methods detecting deep internal structures and to apply them for studying other celestial bodies of the Solar System. This paper shows opportunities of the analytical theory of physical libration for the Moon having a liquid ellipsoidal core to estimate parameters of the free core nutation and of a lunar core flattening.

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